Radiation in space is harmful to both satellites and astronauts. Radiation monitors are used to measure the level of radiation on spacecraft, and efforts are made to reduce the resources needed for such devices while improving the data quality. Additionally, the complex response of the magnetospheric system to space weather events is investigated. In 2013, the Space Application of Timepix Radiation Monitor (SATRAM) was launched onboard the Proba-V satellite. The first part of this thesis demonstrates the capabilities of this single-layer Timepix detector. Particle identification methods are developed to distinguish between electrons, protons, and heavier particles, and particle fluxes are determined. These are compared with electron fluxes measured by the Energetic Particle Telescope (EPT) situated on the same satellite, showing reasonable agreement. The second part of the thesis investigates particle flux variations around geomagnetic storms and interplanetary shock arrivals. Five significant geomagnetic storms ($\mathrm{Dst} < -100\,\mathrm{nT}$) are investigated using data from the Instrument for the Detection of Particle (IDP) on the DEMETER spacecraft. The results consider the respective solar wind parameters and demonstrate two distinct types of storms. Additionally, data from the EPT instrument are used to investigate electron flux variations around interplanetary shock arrivals. A delicate L-shell-dependent interplay between enhanced sources and losses is demonstrated.